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STATISTICAL STUDIES OF MARINE DIATOMS OF THE SAN DIEGO REGION COLLECTED BY U.S.S. PIONEER IN MIDWINTER 1923

BY

WINFRED EMORY ALLEN

UNIVERSITY OF CALIFORNIA PUBLICATIONS IN ZOOLOGY
Vol. 22, No. 12, pp. 445–448

UNIVERSITY OF CALIFORNIA PRESS
BERKELEY, CALIFORNIA
1923

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MAY 4 1953 B-92056

University of California Publications in Zoology
Vol. 22, No. 12, pp. 445–448
Issued November 20, 1923

STATISTICAL STUDIES OF MARINE DIATOMS OF THE SAN DIEGO REGION COLLECTED BY U.S.S. PIONEER IN MIDWINTER 1923*

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WINFRED EMORY ALLEN

(Contribution from the Scripps Institution for Biological Research of the University of California)

INTRODUCTION

By far the most important point in connection with the statistical studies here presented is the fact that three scientific organizations successfully coöperated in accumulating and handling the material. The United States Coast and Geodetic Survey, by using its facilities for collecting and by employing the methods of the Scripps Institution for surface observations and collections, was able to gather a large amount of important material; the Carnegie Institution contributed its facilities for taxonomic study; and the Scripps Institution has contributed its facilities for statistical study of the material. The Coast and Geodetic Survey could not (if it would) handle the material without expanding its resources and applying them in lines subsidiary to the purpose of its existence. The Carnegie Institution could not readily adapt its resources and facilities to the collecting and the statistical examination. The Scripps Institution could not do such collecting and make the taxonomic studies without much greater resources than it has available. Furthermore, much of the information thereby procured is not otherwise obtainable. The three working together can therefore turn out a piece of good scientific work without overstepping bounds or straining resources, and can gain from their coöperation an increased mutual understanding and respect.

Early in 1923 the U. S. S. Pioneer of the United States Coast and Geodetic Survey, which had been doing topographic work in the vicinity of Scripps Institution, La Jolla, California, made two round trips from San Diego to Cortes Bank, holding a variable course not far from Lat. 32° 35′ N. Forty-five samples of microscopic plankton

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were collected. Each sample consisted of organisms caught by filtering five gallons of water (dipped from the surface of the sea) through a small net of No. 25 silk bolting cloth. On the first round trip catches were made on January 22 and 23, outbound, and on February 2, inbound; on the second trip, outbound on February 5 and 6, inbound on February 8 and 9. These collections were turned over to the Scripps Institution for statistical study. For convenience in discussion the catches are arbitrarily assigned to five sections of about eighteen miles each. Beginning with Long. 117° 20′ W, the sections were numbered consecutively to Long. 118° 40′ W, each section including 20′ of longitude. Table 1 shows fairly well the surface distribution of the diatoms in these sections.

TABLE 1

Diatoms

San Diego to Cortes Bank—January-February, 1923
U. S. S. Pioneer

First Round Trip

Section	1	2	3	4	5
Catches	682	0	0	0	180
	132	0	0	18	18
	198	270	576	198	0
	54	5,984	432	450	90
	286	.....	.....	.....	13
Total	1,352	6,254	1,008	666	301
Average	270	1,563	252	166	60

Average to the catch for first trip, 435 to the liter.

Second Round Trip

Section	1	2	3	4	5
Catches	3,888	2,772	264	484	638
	7,150	18,898	198	132	88
	2,904	242	3,740	528	418
	15,104	4,576	229,188	.....	462
	.....	16,038	.....	.....	880
	.....	.....	.....	.....	2,266
	.....	.....	.....	.....	704
Total	29,046	42,526	233,390	1,144	5,456
Average	7,261	8,505	58,347	381	779

Average to the catch for second trip—13,456 to the liter.

Details of the hydrographic data do not have demonstrable connection with changes in the diatom population. Specific gravity was extremely low once and temperature extremely low four times (as compared with the mean) on the first trip. If these extremes be dropped from consideration it may be said that both temperature and specific gravity were slightly lower on the second trip than on the first. There was also much more clear weather, especially at the time of lower temperature, on the second trip. The larger catches of the second trip were all made at temperatures slightly above or very near the mean.

MATERIAL COLLECTED

As shown by table 1 catches on the first trip were very light, only one (made about twenty-three miles west of San Diego) containing more than 1000 to the liter. On the second trip all catches in the first section were over 2000 to the liter, four out of five in the second section were over 2000, and two out of four in the third section were over 3000 to the liter. While section four (directly south of San Clemente Island) and section five (nearer to Cortes Bank) yielded very small catches, the catches were nearly all larger than catches from these sections on the first trip.

Such conditions obviously indicate not only an abrupt change from the non-productive winter season, but also that the causes of change were operative over an area nearly ninety miles in width, extending from the coast line two-thirds of the distance across the continental shelf. Non-microscopic, casual inspection of material collected at the La Jolla pier shows close agreement with this indication in that production increases with the beginning of February and reaches its highest for that period about February 12.

Diatoms.—On the first trip twenty-six species of diatoms were caught, on the second trip, thirty-five. These included practically all of the species which attain numerical prominence at any season. It therefore seems probable that prominence of particular species at certain seasons is due to especially favorable conditions rather than to wholesale migration into the local field. I do not think, however, that this view invalidates the supposition that drift currents may sometimes sweep a large population into any given area. Either or both may account for increased production, according to circumstances.

The exceptional catch of more than 200,000 to the liter at a point about seventeen miles southeast of San Clemente Island seems somewhat abnormal in comparison with all the others of the series. *Chaetoceras scolopendra* Cl. made up more than half of this catch, and, with other small species of *Chaetoceras,* comprised almost the whole number, although *Bacteriastrum varians* Lauder numbered over ten thousand. Evidently this is a good example of localized swarms of minute organisms which we know to occur in open waters.

Except for the large catch in section three, nearly all the larger catches were made in sections one and two, and less than forty miles from shore. In a general way this fact supports the common supposition that production of plants, even in open water, is greater near the coast.

Most of the catches were made at intervals of one hour. Since they differ markedly in numbers, it is evident that distribution throughout the area was not uniform even in those cases where hydrographic data suggested the possibility of approximating to uniform environmental conditions.

Dinoflagellates.—The catches were also examined for dinoflagellates but in no cases were their numbers great enough to have any statistical value. All that can be said is that some were present.

It was very fortunate that the U. S. S. Pioneer made two round trips over the same ground in quick succession for it showed exceptionally well that within a very few days production may radically change over a wide area in the winter season. This showing has additional value because of the fact that it ran approximately parallel with a similar change at the pier and makes it more than ever probable that seasonal changes in production at the pier give a fair basis for judging the general character of seasonal changes in this oceanic area.

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